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ABSTRACT

Results are presented from a 1986 survey of college biology programs. A random sample of biology departments that offer post-baccalaureate degrees were sent questionnaires (30% of 232 responded) that focused on four areas: current departmental practices, anticipated changes in faculty curricular specialization, attracting students to the major, and departmental experiences with self-evaluation. These departments had relatively equal distributions of faculty expertise in molecular, cellular, organismic, and ecological/environmental biology. Most faculty were involved in research and half obtained off-campus grant support. About two-thirds of the departments anticipated expansion in molecular biology or areas requiring molecular techniques. Most programs offered a non-majors course emphasizing the excitement, fun and relevance of biology; few students seemed to take biology for elective or personal reasons. Almost all departments have undertaken self-study and found the process productive. This publication includes a copy of the questionnaire and tables of the responses to each item as appendices. (Author/CW)

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Undergraduate Biology Curriculum Survey

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May 1988

In the mid-1960's university enrollments expanded rapidly with a concomitant increase in faculty. Today, many faculty hired during that period are reaching retirement age. As a result universities will be hiring replacement faculty at an accelerated rate in the next few years.

Biology programs are faced with an additional task. Not only must they fill positions vacated by retirements, but they must update curricula and hire faculty to keep pace with the changes in the field. The biology field today is vastly different from that of even a few years ago. Genetics, molecular biology and computer use in quantitative biology have been the fuel for this rapid development of the discipline. As a result biology departments must update curricula as they replace retiring faculty.

The department of Biological Sciences at California State University, Chico is presently at this cross-road. As we face numerous retirements in the next several years, we must formulate hiring and curricular policies which maintain the present level of excellence, yet reflect current trends and curricula in the field. We have surveyed departments similar to ours to ascertain trends as a guide to designing our own future. The areas we have focused on are:

1. current practices of biology departments,
2. anticipated changes in faculty curricular specialization,
3. attracting undeclared students into the biology major,
4. comparison of research with teaching institutions, and,
5. biology departments experiences with self evaluation.

The survey was distributed to 232 institutions randomly selected from Peterson's Graduate Programs in the Biological, Agricultural and Health Sciences 1985. Results represent data from the 64 respondents.

METHOD

Instrument

The survey instrument is contained in Appendix A. It was developed by the Curriculum Committee of the Department of Biological Sciences at California State University, Chico. The survey is primarily concerned with acquiring information about curriculum emphases, current employment practices (such as the use of TA's and part-timers), and expectations about future hirings by areas of specialization.
A cover letter from the Chair and survey Project Coordinator accompanied the survey instrument. Although an identifying code number was on each survey, respondents were guaranteed anonymity.

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Subjects

Chico's Biological Sciences Department desired information about programs from institutions of a similar size and nature (middle to large with post-baccalaureate programs). The population under study was defined as the 503 Biology/Biomedical Sciences Schools, Colleges and Multipurpose Departments listed in Peterson's Graduate Programs in the Biological, Agricultural & Health Sciences 1985. A sample of 218 was randomly selected from this population; a sample of such size would give an accuracy of plus or minus 5% with a level of confidence of 95% given the population size. An additional 14 institutions were added for a special purpose--these were institutions specified by the California Postsecondary Education Commission as comparison institutions for salary surveys. Six other comparison institutions, on CPEC's list of 20, had already been included in the sample of 218. The final sample was thus comprised of 232 institutions.

Procedure

Surveys with cover letters were sent to the 232 institutions along with prepaid return envelopes on December 5th, 1986. All but two of the 68 responses were received by the end of the first week in February, 1987. The response rate was just under 30%. The response rate may have been inhibited by the season (Christmas and end-of-term for most colleges). The response rate might have been enhanced if some followup prompt had been sent as well. Four of the responses were unusable; two were returned too late and two were returned blank (one with some catalog information).

The results were entered into a SIR (Scientific Information Retrieval) database via SIR's FORMS data entry system. An SPSS (Statistical Package for the Social Sciences) system file of the data was written from the SIR database, all analyses were conducted on the SPSS file.

RESULTS

The results are presented in Table 1. The following describes the results in narrative form. The respondent group was divided into two subgroups based on their response to survey question #3. The first subgroup was comprised of departments focused on "teaching only" or "teaching emphasized" (45% of the 64 responses). The second subgroup (55%) was formed from those departments where "teaching and research have equal emphasis" or "research emphasized". The responses of these two subgroups were compared on the remainder of the survey items. The differences in responses of these two groups are given below, and in Table 1, only when statistically significant differences existed between them.

The second question had respondents rank the departmental emphasis placed upon four levels (molecular, cellular, organismic & ecological) for each of four curricular areas: Biological Sciences, Botany, Microbiology , and Zoology. For the areas of Biological Sciences, Botany, and Zoology the greatest emphasis was placed on the organismic level and the least at the molecular. The cellular level was perceived as most emphasized in the domain

of Microbiology, while the ecological level was least emphasized. The average undergraduate headcount of participating institutions was almost 8700; institutions with a teaching emphasis were smaller, about 6400, than those with a greater focus on research--about 10700. The average department size was 357 undergraduates. The average responding Biology department had 32 Master's candidates and 25 PhD candidates (for those with such programs). The average institution had almost 1200 masters and 800 PhD candidates. Institutions with research emphases had more masters students than those with teaching emphases (1758 vs. 679).

These Biology departments had, on average, 21 full-time faculty, 4 part-time faculty and almost 16 teaching assistants. Institutions with teaching emphases had significantly fewer full-time faculty and teaching assistants than did the others--reflecting their smaller size in part.

The usual degree held by part-time faculty was predominantly the PhD (70% overall). Very few held only a baccalaureate. The part-timers at institutions with more research focus were more likely to have the terminal degree than their counterparts at teaching institutions. The usual degree held by teaching assistants was the baccalaureate; very few held doctoral degrees.

Faculty specializations were evenly destributed across the areas of Organismic, Ecological/Environmental, Cellular, and Molecular Biology. Only eight percent were reported to be in "Other" areas.

About two-thirds of full-time faculty were involved in research. Those in teaching institutions were involved less (57%) than those in institutions with research emphases (72%). About 40% had off-campus grant support. Those in institutions with research emphases had more support, than their peers at schools emphasizing teaching.

The average responding department expected 4 new faculty hires in the next five years. The average number of teaching hours per week was reported as 10.1. Not surprisingly, institutions with teaching emphases reported more teaching hours (12.1) than did their colleagues at institutions with research emphases (8.4).

Respondents ranked nine reasons students take Biology courses. The most common were major requirements and pre-professional training. The least common were elective/personal enrichment, teacher preparation, and preparation for non-health jobs. Items with intermediate rankings were health related training, preparation for graduate school, courses required by other departments, and General Education. Departments emphasizing research reported that pre-professional training was a more common reason for course consumption and preparation for non-health jobs was a less common reason, than did the other colleges.

Almost three-fourths of the departments had publications other than the "Catalog" which described their programs and requirements to students and/or prospective majors.

The questionaire assessed whether departments had special requirements for biology undergraduates. One-third required an experimental research project;

and, slightly more required a library research project. Small minorities, about one in eight, required field station experience or had other special requirements.

Two-thirds of the departments reported having introductory courses specifically designed for non-majors. Most of these (80%) do not allow this course to be substituted for the beginning course for majors.

About half of the responding colleges have no team-taught introductory courses and a further fourth have only a few. One eighth team-teach all such courses. The respondents reported half their labs taught by full-time faculty, two-thirds by graduate teaching assistants, and over an eighth by part-time faculty. Since this obviously sums to well over 100%, we assume that team-teaching accounts for this phenomenon--with the usual laboratory teaching team comprised of a faculty member and a graduate student assistant.

Respondents were asked whether they expected changes in the number of faculty specialized in each of six areas: Molecular Biology, Cellular Biology, Organismic Biology, Ecological/Environmental, Behavioral Biology, and General Education offerings. In four areas little change was expected: Behavioral Biology, General Education offerings, Ecological/Environmental, and Organismic Biology.

Almost two-thirds expected expansion in the faculty in Molecular Biology. Colleges with research emphases expected more than the others. The primary reasons were updating the curriculum to match changes in the field and to replace retiring/turnover faculty. While only 15% overall checked the reason "changes in requirements for Biology majors", those from schools with teaching emphases were more likely to have done so than institutions with research emphases.

About one-third expected faculty expansion in the area of Cellular Biology. The most common reasons were, again, updating curriculum to match changes in the field and faculty retirements/turnover.

All but two of the sixty-four respondents had reviewed their curricula in the last ten years. The average number of such reviews in the last ten years was 2.3. Almost all such reviews (91%) are conducted with departmental faculty participating. About forty percent of such reviews have off-campus faculty participating; evenly split between those involved with accreditation and those conducted independently from accreditation.

Two reasons were regularly cited as motivating these reviews. The first was an accreditation or policy mandate. The second frequently expressed reason was a "feeling that the curriculum is dated--does not prepare students for the biology of the 80's and 90's." The respondents comments indicate mandated reviews are sometimes perceived as a bureaucratic gauntlet, and therefore are not taken seriously. Most departments view both mandated and voluntary reviews as opportunities to evaluate department and student objectives and tune curricula.

The effects of self-reviews covers a wide spectrum. Responses ranged from "damn little" change to "complete overhaul" with course offerings changing by 80%. Most reported beneficial changes which updated and integrated the

curriculum.

Additional comments were solicited at the end of the survey. About one-third offered comments. The responses were varied, but the following three reflect the curriculum philosophies of many respondents:

"Undergrads need to do science rather than cookbook it."

"Curriculum must adjust to accomodate expansion of molecular and cellular biology."

"Problem solving or independent study is needed to develop analytical and creative skills rather than information, since informational bases in biology shift so rapidly..."

DISCUSSION

This survey collected information about practices and expected trends in post-secondary biology education. Responses were obtained from a random sample of colleges and universities offering post-baccalureate programs in biology. The results are representative of the some 30% of such institutions who will respond to a mailed survey instrument. While the modest participation rate restricts the generalization of the findings, there is no particular evidence that suggests that non-responding programs are different in any way.

Current practices of biology departments

Several questions were designed to describe current biology curricula. Overall, the composite institution has a relatively equal distribution of faculty expertise in molecular, cellular, organismic and ecological/environmental areas; although this does not mean that each institution has this balance.

Biology is a science founded upon experimentation and research. Overall responses indicated most faculty are involved in research, and half of these obtain off-campus grant support. Is research and grantsmanship incompatible with programs which emphasize teaching? The majority of faculty at "teaching" institutions are actively involved in research, and many receive some outside funding. Although C.S.U. Chico classifies itself as primarily a teaching institution, we feel that research is an important tool to achieve some of our teaching goals and to develop undergraduate students' analytical processes and independence. It is both interesting and encouraging that almost half the programs require an undergraduate library research project and one-third require an experimental research project.

A final observation concerns how universal team teaching may be. More than half of responding institutions indicated some use of team teaching in introductory courses. The survey did not explore this in depth, however we expect the usual pattern is a pairing of a faculty member with a graduate teaching assistant.

Trends in faculty curricular specialization

As expected the areas of maximum planned expansion were in molecular biology. The motivation for expansion in most instances was to update curricula. This emphasizes the need for departments to regularly assess the rapidly changing discipline of biology in determining areas to expand and reduce emphasis. Whenever a faculty retires, the department must decide the current direction of biology, assess its composite expertise, then determine the area to seek new hires from. If retirees are merely replaced by "clones" with similar expertise, it would not take long before a department finds itself (and its students) a generation behind in biological theory and skills.

Most interesting to us, and probably of major interest to those reading this report, were the responses to a question which asked what two areas of specialty the department would hire in. Although varied, particular specialties dominated responses. Responses were so specific that they were arbitrarily clustered into categories by the authors (ex. molecular biologist, molecular genecist, molecular neurobiologist were clustered as "molecular biologist"). Specific responses are tabulated in Appendix B. The most frequent categories for first choice of hiree were molecular biologist (45%), microbiologist/immunologist (18%), and genecist (14.5%). The most frequent specialties for second choice of hiree were molecular biologist (17%), ecologist (14%), and microbiologist/immunologist (13%). This could be interpreted to indicate that each department should have its own resident molecular biologist. However, responses indicate that departments are not necessarily hiring molecular biologists, but biologists who use molecular techniques to answer questions in areas such as endocrinology, neurobiology, genetics, plant biology, etc. These responses reflect the direction described in the introduction as areas that biology is expanding into - molecular biology, genetics and quantitative ecology.

Attracting students into the major

Over the last several years our department has experienced a decline in majors. Possible areas from which to recruit include high schools, junior colleges, and undeclared undergraduates at C.S.U. Chico. Since all undergraduates must take our introductory non-majors' biology course, we perceived this as a likely source of future majors. Currently our introductory non-majors' course is designed so that students may substitute it for the majors' introductory course. This is not a common policy among comparable institutions; only a fifth of institutions which offer a non-majors' course allow it to substitute for the majors' course. Apparently most institutions offer a non-majors course which emphasizes the excitement, fun and relevance of biology, with less detailed presentation of principles; clearly a possible means to entice undeclared students into the biology major. It is interesting that the least frequent reason students take biology is as an elective or for personal satisfaction. Since most aspects of biology have substantive practical applications, we might give more attention to "marketing" our discipline along the lines of personal growth and enjoyment.

Comparison of responses from "Teaching" vs "Research" institutions

There is very little difference in curriculum policy between teaching and research institutions. Most of the differences may be attributed to size; institutions emphasizing research are larger than teaching institutions.

Other differences were:

- -teaching hours/week (12.1 vs 8.4)--possibly a reflection of grant generated release time,
- -higher percent of PhD faculty at research institutions,
- -lower percent of lower division labs taught by full-time faculty at research institutions,
- -higher percent of faculty with off-campus support at research institutions, and,
- -more expansion of faculty positions expected in Molecular Biology at research institutions.

Experiences with self-evaluation

Biology is a rapidly changing discipline; our curricula must reflect the dynamic state of today's and tomorrow's biology. Internal and external curricula reviews are important processes for assessing a department's currency. Almost all respondents indicated some mechanism of review, with an average of 2.3 reviews every 10 years. One fifth had been reviewed by an off-campus team other than an accreditation team, while another fifth had been reviewed by an external accreditation team.

Most respondents reported that the review process was productive. However, a minority did not find it so. This suggests that a review should be only undertaken after a careful consideration of a department's needs and goals. The external review we are presently going through has united our department into a professional unit. We are establishing mechanisms which include the entire department in decisions regarding curriculum, core course content, and hiring new faculty.

California State University, Chico
Chico, California 95929-0515

Biological Sciences
(916) 895-5356

Dear Colleague,

The Department of Biological Sciences at California State University, Chico is evaluating its curriculum. We hope to accomplish the following objectives:

1. Optimize curriculum to meet student needs.
2. Optimize our faculty resources.
3. Determine areas for new faculty hires.
4. Attract/recruit majors.

Your responses to the following questions are central to decisions we will be making, and we would appreciate very much learning about your department and how you organize your programs. We intend to submit a copy of our findings to ERIC(the Educational Research Information Clearinghouse) where it will be generally available. If you would like to receive our final report, we will be pleased to send you a copy, if you so indicate below(Item 23). We've included an I.D. number on the survey so we can integrate additional information with your response (eg. NSF data on institutions). Our published research results will only refer to groups of institutions. Your institution's identified data will never be released or published. Thank you for your time and your contributions to our review.

Sincerely,

William F. Derr

Larry Hanne

William Derr, Chair
Larry Hanne, Project Coordinator
Department of Biology

The California State University

Curriculum Questionnaire

1. What is the name of your department? _____

2. For each of the curriculum areas below (a-d) rank the emphasis your department places on the four levels indicated.
(1=most emphasis, ..., 4=least emphasis)
   a. Biological Sciences
      ___molecular ___cellular ___organismic ___ecological
   b. Botany
      ___molecular ___cellular ___organismic ___ecological
   c. Microbiology
      ___molecular ___cellular ___organismic ___ecological
   d. Zoology
      ___molecular ___cellular ___organismic ___ecological

3. Describe the emphasis your department places on research vs teaching. (Check one)
   ____Teaching only
   ____Teaching emphasized
   ____Teaching and research have equal emphasis
   ____Research emphasized

4. Enter the approximate number(headcount) of students in each category:

	Total for Institution	Departmental Majors
Undergraduate	_____	_____
Masters	_____	_____
PhD	_____	_____

5. Enter the number of instructional faculty(headcount) in your department for each of the following categories:
   ____Full-time faculty
   ____Part-time faculty
   ____Teaching assistants

6. Indicate the usual degree held by your department's...
   Part-time faculty ( )BA/BS ( )MA/MS ( )PHD
   Teaching assistants ( )BA/BS ( )MA/MS ( )PHD

7. Estimate the % of your full-time faculty members with the following specializations: (One area per faculty; should sum to 100%)
   ____Molecular
   ____Cellular
   ____Organismic
   ____Ecological/Environmental
   ____Other (specify)_____

8. For your full-time faculty members, estimate the following:
   ____% of faculty actively involved in research
   ____% of faculty with off-campus grant support
   ____number of new faculty hires anticipated in next 5 years
   ____average teaching hours per week

9. Rank the following reasons why students take courses in your department: (1=most common/frequent, ...,9=least common/frequent)
____Departmental major requirement
____Preprofessional (MD, DVM, DDS, etc.)
____Other health related training (Med tech, phys thera, etc.)
____Teacher preparation
____Preparation for jobs, other than in health related fields
____Preparation for graduate school
____Courses required by other departments
____General Education
____Elective/personal enrichment

10. Do you have publications, other than the "Catalog" which describe curriculum requirements to students and/or prospective majors?
( )No ( )Yes
If you marked "Yes", we would greatly appreciate it if you would enclose copies of such materials with this questionnaire.

11. Check any of the following that are required of your undergraduate majors:
____Library research project
____Experimental research project
____Field station experience
____Other special requirements (specify)_____

12. Do you offer an introductory general biology course designed specifically for non-majors?
( )No ( )Yes
If "Yes", can this course be substituted for your beginning general course for majors?
( )No ( )Yes

13. How many of your introductory courses are regularly taught with more than one faculty presenting material in a section (ie. team taught)?
( )none ( )few ( )half ( )most ( )all

14. Indicate the percent of lower division laboratory sections taught by:
____Full-time faculty
____Part-time faculty
____Graduate student teaching assistants

15. Do you expect changes in the number of full-time faculty specialized in Molecular Biology? (Leave blank if not applicable)
____Reduction in faculty
____No change
____Expansion in faculty
If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)
____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

16. Do you expect changes in the number of full-time faculty specialized in Cellular Biology? (Leave blank if not applicable)

____Reduction in faculty
____No change
____Expansion in faculty

If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)

____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

17. Do you expect changes in the number of full-time faculty specialized in Organismic Biology? (Leave blank if not applicable)

____Reduction in faculty
____No change
____Expansion in faculty

If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)

____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

18. Do you expect changes in the number of full-time faculty specialized in the Ecological/Environmental area? (Leave blank if not applicable)

____Reduction in faculty
____No change
____Expansion in faculty

If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)

____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

19. Do you expect changes in the number of full-time faculty specialized in Behavioral Biology? (Leave blank if not applicable)

____Reduction in faculty
____No change
____Expansion in faculty

If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)

____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

20. Do you expect changes in the number of full-time faculty specialized in General Education offerings? (Leave blank if not applicable)

____Reduction in faculty
____No change
____Expansion in faculty

If you checked either "Reduction" or "Expansion", indicate the reasons. (Check all that apply)

____Changes in the number of Biology majors
____Changes in requirements for Biology majors
____Changes in the number of "service" majors
____Changes in the requirements for "service" majors
____Overall growth in the University
____Changes in General Education requirements
____Update curriculum to match changes in field of Biology
____Faculty retirements and/or turnover
____Other, (specify)_____

21. If given 2 free faculty positions, what specific area(s) of specialty would your department hire?

_____

_____

22. Has your department reviewed its curriculum in the last ten years?

____No, please skip to question 23
____Yes, please answer questions 22a through 22d

22a. ____Number of reviews you've conducted in the last ten years?

22b. What has motivated these reviews?

_____

_____

_____

_____

22. (continued)

22c. How much change has ensued as a result of these reviews?

_____

_____

_____

_____

_____

22d. Who has conducted these reviews? (Check all that apply)

____Departmental committee
____Non-departmental faculty
____Off-campus faculty as part of accreditation visit
____Off-campus faculty, conducted independtly from accreditation
____Other, (specify)_____

23. ____Check here if you would like a copy of our report with the results from this survey. Thank you for sharing your valuable time. (Please specify name and complete address)

_____

24. This questionnaire may have failed to capture all of your important thoughts regarding trends in college level Biology curricula. We would appreciate any of your comments.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU!

APPENDIX B

Responses to question #21 -- "If given 2 free faculty positions, what specific area(s) of specialty would your department hire?"

RESPONDANT #	CHOICE 1	CHOICE 2
# 049	IMMUNOLOGIST	ECOLOGIST
# 207	TISSUE CULTURE/GENETIC ENGINEER	BIOTECHNONLGY
# 202	PHYSIOLOGY - COMPARATIVE OR MAMMALIAN	MOLECULAR BIOLOGY
# 119	VIROLOGIST	ETHNOLOGIST
# 240	CELL/MOLECULAR	BOTANY/ECOLOGY
# 021	MOLECULAR BIOLOGY	MICROBIOLOGY-VIROLOGY
# 252	MICROBIOLOGY/IMMUNOLOGY	ENDOCRINOLOGY/PHARMACOLOGY
# 032	MICROBIOLOGY	IMMUNOBIOLOGY/BIOCHEMISTRY
# 109	CELLULAR ECOLOGY e.g. PLANT PHYSIOLOGY	CELL/MOLECULAR MICROBIOLOGY
# 016	MOLECULAR GENETICS	MOLECULAR IMMUNOBIOLOGY
# 029	CELL BIOLOGY	PLANT MOLECULAR BIOLOGY
# 004	FERMENTATION	CONSTR. ADMINISTRATION
# 190	PLANT MOLECULAR BIOLOGY	NEUROBIOLOGY
# 072	BOTANY/CELLULAR MOLECULAR	BIOCHEMISTRY
# 158	APPLIED MICROBIOLOGY	MICROBIOL SENETICIST
# 045	MICROBIOLOGY - MOLECULAR	HISTOLOGY
# 217	MOLECULAR GENETICS	SYSTEMATIC BOTANY
# 108	INDUSTRIAL MICROBIOLOGIST	NATURAL PRODUCT BIOCHEMIST
# 160	VERTEBRATE ZOOLOGIST	MOLECULAR BIOLOGIST
# 031	MOLECULAR	ANIMAL BEHAVIOR
# 251	APPLIED MICROBIOLOGIST	PLANT MOLECULAR GENETICIST
# 102	NATURAL HISTORY	BEHAVIORAL BIOLOGY
# 173	MOLECULAR BIOL	ORGANISMIC BIOL
# 198	PLANT MOLECULAR BIOLOGIST	PLANT POPULATION BIOLOGIST
# 034	ECOLOGICAL GENETICS	GENETIC ENGINEERING
# 024	INVERTEBRATE PHYSIOLOGIST	DENTHIC ECOLOGIST
# 146	MICROBIOLOGY	MOLECULAR BIOLOGY
# 139	VIROLOGY	POPULATION GENETICS
# 136	SCIENCE EDUCATION (BIOLOGY)	
# 215	MOLECULAR BIOLOGY	BEHAVIOR
# 043	MOLECULAR GENETICS	EVOLUTIONARY ECOLOGY
# 114	ECOLOGY	BIOTECHNOLOGY
# 184	MOLECULAR NEUROBIOLOGIST	PLANT MOLECULAR BIOLOGIST
# 090	GENETICS	CELL BIOLOGY
# 074	MOLECULAR BIOLOGY	VIROLOGY
# 023	BIOCHEMICAL (MEDICAL) GENETICS	MOLECULAR BIOLOGIST
# 089	MOLECULAR BIOLOGY OF DEVELOPMENT	ENDOCRINOLOGIST
# 091	MOLECULAR	ENVIRONMENTAL
# 159	DEVELOPMENTAL BIOLOGY (with molecular approach)	ENDOCRINOLOGY
# 050	IMMUNOLOGY	ECOLOGY
# 128	NEUROBIOLOGY	BIOTECHNOLOGY
# 081	MODERN DEVELOPMENTAL	PLANT MOLECULAR BIOLOGY

# 164	MOLECULAR BIOLOGY	DEVELOPMENTAL BIOLOGY
# 123	MICROBIOLOGY	PHYSIOLOGY
# 213	AQUATIC BIOLOGY	
# 062	PHYSIOLOGY	GENETICS
# 180	GENETICS	PLANT PHYSIOLOGY
# 011	ECOLOGY	PHYSIOLOGY
# 087	VIROLOGY	PARASITE IMMUNOLOGY
# 212	DEVELOPMENTAL BIOLOGY	NEUROPHYSIOLOGY
# 259	CELL/MOLECULAR BIOL	NEUROBIOLOGY
# 100	MOLECULAR BIOLOGY	PLANT SCIENCE
# 250	YEAST MOLECULAR BIOLOGIST	ACADEMIC STAFF/NON FACULTY TO TEACH AND COORDINATE UNDERGRADUATE LOWER LEAD COURSES TO RELIEVE RESEARCH FACULTY TEACHING LOAD
# 263	MOLECULAR BIOLOGY (i.e. "genes")	IMMUNOLOGY (cell emphasis)
# 033	MOLECULAR BIOLOGY AND GENETICS	MICROBIOLOGY
# 129	MOLECULAR GENETICS	MATHEMATICAL ECOLOGY
# 255	MOLECULAR BIOLOGY	ALLIED HEALTH SCIENCES
# 195	BEHAVIOR	MOLECULAR
# 248	MOLECULAR GENETICS	POPULATION GENETICS
# 258	DEVELOPMENTAL BIOLOGY	HISTOLOGY
# 163	BIOTECHNOLOGY	MOLECULAR BIOLOGY
# 256	MOLECULAR	ORGANISMAL/ECOLOGICAL
# 082	CELL/MOLECULAR	GENETICS